

WHAT IS CLAIMED IS:

1. A semiconductor device comprising:
 - a first gate electrode formed on an insulating surface;
 - a first gate insulating film formed on the first gate electrode;
 - a first semiconductor layer formed on the first gate insulating film;
 - a second semiconductor layer formed on the first semiconductor layer;
 - a third semiconductor layer formed on the second semiconductor layer;
 - a second gate insulating film formed on the third semiconductor layer; and
 - a second gate electrode formed on the second gate insulating film, wherein:
 - the first and third semiconductor layers comprise a same material.
2. A semiconductor device comprising:
 - a first gate electrode formed on an insulating surface;
 - a first gate insulating film formed on the first gate electrode;
 - a first semiconductor layer formed on the first gate insulating film;
 - a second semiconductor layer formed on the first semiconductor layer;
 - a third semiconductor layer formed on the second semiconductor layer;
 - a second gate insulating film formed on the third semiconductor layer; and
 - a second gate electrode formed on the second gate insulating film, wherein:
 - the first and third semiconductor layers comprise a same material, and

the first semiconductor layer, the second semiconductor layer, and the third semiconductor layer each include a source region or a drain region which contains an impurity element for imparting one conductivity type at the concentration of 1×10^{19} to $1 \times 10^{20}/\text{cm}^3$.

3. A semiconductor device comprising: 3
a first gate electrode formed on an insulating surface;
a first gate insulating film formed on the first gate electrode;
a first semiconductor layer formed on the first gate insulating film;
a second semiconductor layer formed on the first semiconductor layer;
a third semiconductor layer formed on the second semiconductor layer;
a second gate insulating film formed on the third semiconductor layer; and
a second gate electrode formed on the second gate insulating film, wherein:
an energy band of the second semiconductor layer is higher than energy bands of the first and third semiconductor layers.

4. A semiconductor device comprising: 4
a first gate electrode formed on an insulating surface;
a first gate insulating film formed on the first gate electrode;
a first semiconductor layer formed on the first gate insulating film;
a second semiconductor layer formed on the first semiconductor layer;
a third semiconductor layer formed on the second semiconductor layer;
a second gate insulating film formed on the third semiconductor layer; and
a second gate electrode formed on the second gate insulating film, wherein:

an energy band of the second semiconductor layer is higher than energy bands of the first and third semiconductor layers, and

the first semiconductor layer, the second semiconductor layer, and the third semiconductor layer each include a source region or a drain region which contains an impurity element for imparting one conductivity type at the concentration of 1×10^{19} to $1 \times 10^{20}/\text{cm}^3$.

5. A semiconductor device according to claim 1, wherein the first gate electrode and the second gate electrode are formed of an alloy or a compound composed of one kind or plural kinds of elements selected from the group consisting of tungsten (W), molybdenum (Mo), tantalum (Ta), and titanium (Ti).

6. A semiconductor device according to claim 2, wherein the first gate electrode and the second gate electrode are formed of an alloy or a compound composed of one kind or plural kinds of elements selected from the group consisting of tungsten (W), molybdenum (Mo), tantalum (Ta), and titanium (Ti).

7. A semiconductor device according to claim 3, wherein the first gate electrode and the second gate electrode are formed of an alloy or a compound composed of one kind or plural kinds of elements selected from the group consisting of tungsten (W), molybdenum (Mo), tantalum (Ta), and titanium (Ti).

8. A semiconductor device according to claim 4, wherein the first gate electrode and the second gate electrode are formed of an alloy or a compound composed of one kind or plural kinds of elements selected from the group consisting of tungsten (W), molybdenum (Mo), tantalum (Ta), and titanium (Ti).

9. A semiconductor device according to claim 1, wherein the semiconductor device is implemented in an electronic apparatus selected from the group consisting of a personal computer, a video camera, a mobile

computer, a player using a record medium recorded with programs, a digital camera, a front type projector, a rear type projector, a portable telephone, a portable book and a display.

10. A semiconductor device according to claim 2, wherein the semiconductor device is implemented in an electronic apparatus selected from the group consisting of a personal computer, a video camera, a mobile computer, a player using a record medium recorded with programs, a digital camera, a front type projector, a rear type projector, a portable telephone, a portable book and a display.

11. A semiconductor device according to claim 3, wherein the semiconductor device is implemented in an electronic apparatus selected from the group consisting of a personal computer, a video camera, a mobile computer, a player using a record medium recorded with programs, a digital camera, a front type projector, a rear type projector, a portable telephone, a portable book and a display.

12. A semiconductor device according to claim 4, wherein the semiconductor device is implemented in an electronic apparatus selected from the group consisting of a personal computer, a video camera, a mobile computer, a player using a record medium recorded with programs, a digital camera, a front type projector, a rear type projector, a portable telephone, a portable book and a display.

13. A semiconductor device comprising:
a first gate electrode formed on an insulating surface;
a first gate insulating film formed on the first gate electrode;
a first semiconductor layer formed on the first gate insulating film;
a second semiconductor layer formed on the first semiconductor layer;

a third semiconductor layer formed on the second semiconductor layer;
a second gate insulating film formed on the third semiconductor layer; and
a second gate electrode formed on the second gate insulating film, wherein:
the first semiconductor layer and the third semiconductor layer each have an AlGaAs film; and
the second semiconductor layer has a GaAs film.

14. A semiconductor device comprising:
a first gate electrode formed on an insulating surface;
a first gate insulating film formed on the first gate electrode;
a first semiconductor layer formed on the first gate insulating film;
a second semiconductor layer formed on the first semiconductor layer;
a third semiconductor layer formed on the second semiconductor layer;
a second gate insulating film formed on the third semiconductor layer; and
a second gate electrode formed on the second gate insulating film, wherein:
the first semiconductor layer and the third semiconductor layer each have an AlGaAs film;
the second semiconductor layer has a GaAs film; and
the first semiconductor layer, the second semiconductor layer, and the third semiconductor layer each include a source region or a drain region which contains an impurity element for imparting one conductivity type at the concentration of 1×10^{19} to $1 \times 10^{20}/\text{cm}^3$.

15. A semiconductor device according to claim 13, wherein the first gate electrode and the second gate electrode are formed of an alloy or a compound of one kind or plural kinds of elements selected from the group

consisting of tungsten (W), molybdenum (Mo), tantalum (Ta), and titanium (Ti).

16. A semiconductor device according to claim 14, wherein the first gate electrode and the second gate electrode are formed of an alloy or a compound of one kind or plural kinds of elements selected from the group consisting of tungsten (W), molybdenum (Mo), tantalum (Ta), and titanium (Ti).

17. A semiconductor device according to claim 13, wherein the semiconductor device is implemented in an electronic apparatus selected from the group consisting of a personal computer, a video camera, a mobile computer, a player using a record medium recorded with programs, a digital camera, a front type projector, a rear type projector, a portable telephone, a portable book and a display.

18. A semiconductor device according to claim 14, wherein the semiconductor device is implemented in an electronic apparatus selected from the group consisting of a personal computer, a video camera, a mobile computer, a player using a record medium recorded with programs, a digital camera, a front type projector, a rear type projector, a portable telephone, a portable book and a display.